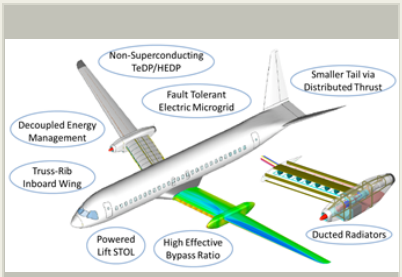
Continued Development of Environmentally Conscious "ECO" Transport Aircraft Concepts as Hybrid Electric Distributed Propulsion Research Platforms, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

ESAero's vast TeDP and HEDP-specific experience, Helden Aerospace's distributed propulsion airframe integration effects & CFD analysis experience, and Rolls-Royce's propulsion and power, thermal management, and fault tolerant microgrid systems design experience will be leveraged to develop the ECO-150 and ECO-80 concepts as Vision Vehicles which can become research platforms to investigate the potential merits of novel technologies and stand as well-defined and reputable reference vehicle benchmarks. The ECO concepts will represent rational approaches to incorporating multiple NASA technologies in a synergistic manner for the 2030-2040 timeframe, including distributed energy management, embedded fan split-wing configuration for powered lift and improved aerodynamic efficiency and structural rigidity, ducted radiator cooling systems, hybrid power supplementation, and tail reduction via propulsive aircraft control. Complete design iterations of the ECO-150 and ECO-80 concepts will incorporate lessons learned relating to the following objectives and cross-check them with the existing vehicle design, competing discipline requirements, and detailed component integration: (1) Advance the TeDP system design through non-superconducting, high power microgrid design and detailed motor/generator sensitivity analyses; (2) Advance the TMS design with a new TMS architecture for redundancy and by applying thermal capacitance to achieve transient performance targets; (3) Take credit for the propulsion system?s utility as an aircraft control mechanism and address any new design requirements this imposes on the aircraft; (4) Investigate hybrid power supplementation and establish a roadmap for the sizing and synthesis of HEDP architectures; (5) Continue the high-fidelity aero-propulsion CFD study to improve the high lift and cruise efficiency of the split-wing design, and use the CFD results to validate and calibrate ESAero?s analytical propulsion duct models.



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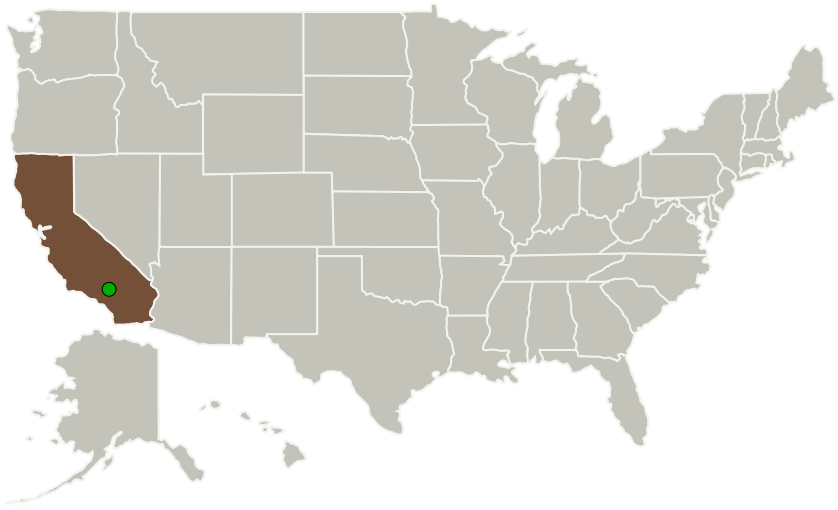
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Empirical Systems Aerospace, Inc.(ESAero)	Lead Organization	Industry	Pismo Beach, California
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Empirical Systems Aerospace, Inc. (ESAero)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Benjamin T Schiltgen

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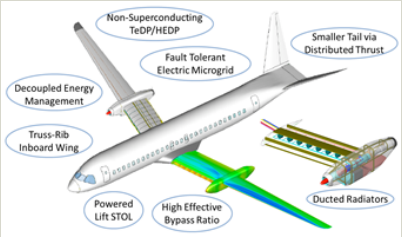
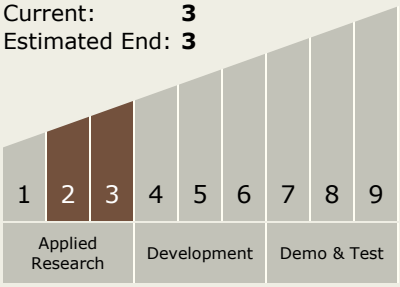
Images



Briefing Chart Image
Continued Development of Environmentally COnscious "ECO" Transport Aircraft Concepts as Hybrid Electric Distributed Propulsion Research Platforms, Phase II
(https://techport.nasa.gov/image/133531)

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.9 Hybrid Electric Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System